

Nutrient Assessment for TMDLs in the Northwest



Periphyton



Phytoplankton

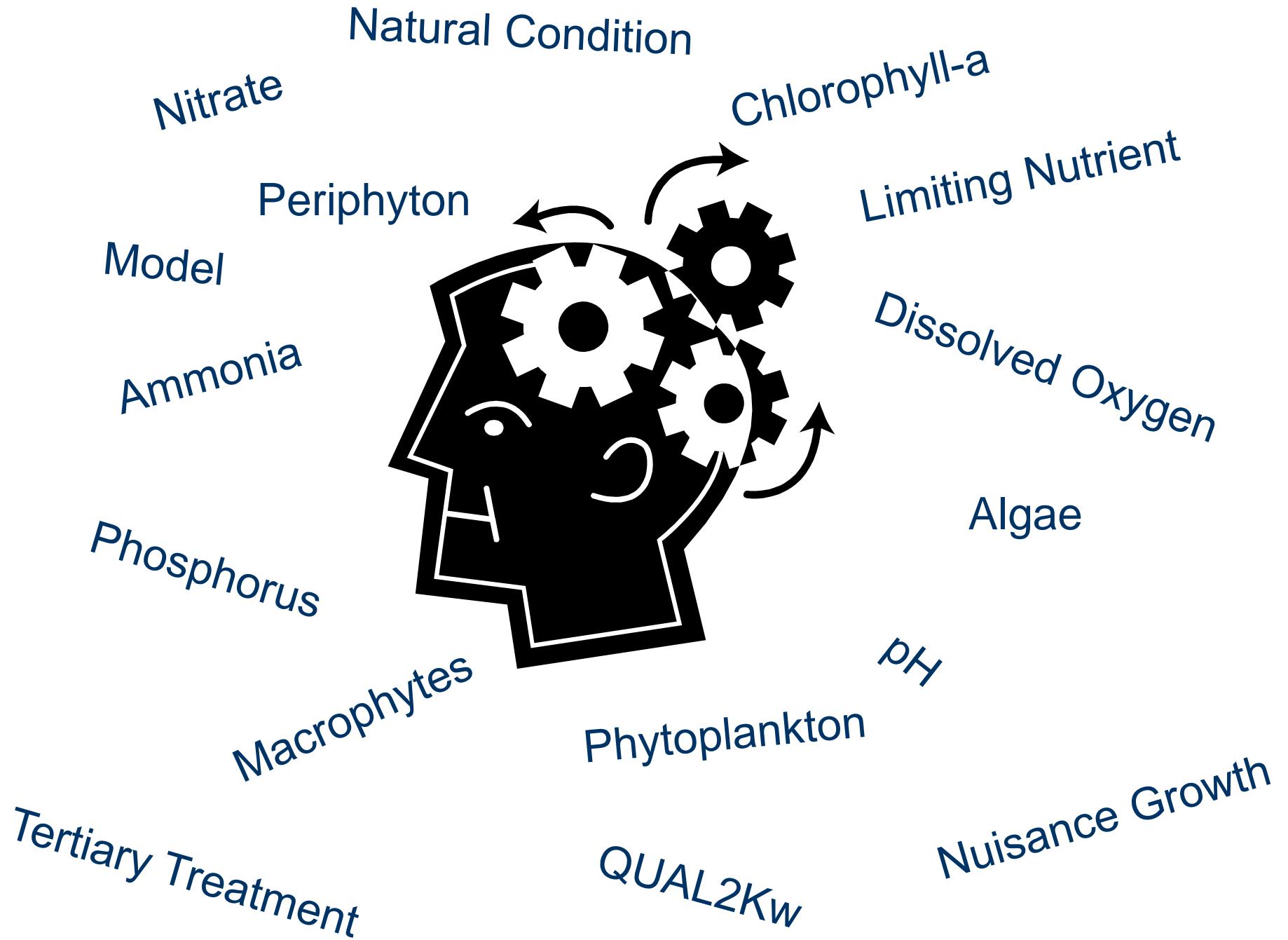


Macrophytes

Ben Cope

EPA Region 10

Office of Environmental Assessment



Nutrient Assessment is a/an _____.

Menagerie: agglomeration, alphabet soup, assortment, clutter, collage, crazy quilt, farrago, gallimaufry, grab bag, gumbo, hash, hodgepodge, hotchpotch, jambalaya, jumble, jungle, litter, macédoine, medley, mélange, miscellany, miscellanea, mishmash, mixed bag, montage, motley, muddle, olio, olla podrida, omnium-gatherum, pastiche, patchwork, patchwork quilt, potpourri, ragbag, ragout, rummage, salad, salmagundi, scramble, shuffle, smorgasbord, stew, tumble, variety, welter

“Smorgasbord” of Settings

State Standards

Staff Expertise

Waterbody Types

Source Types

Available Data

Time and Money

Stakeholder Pressures

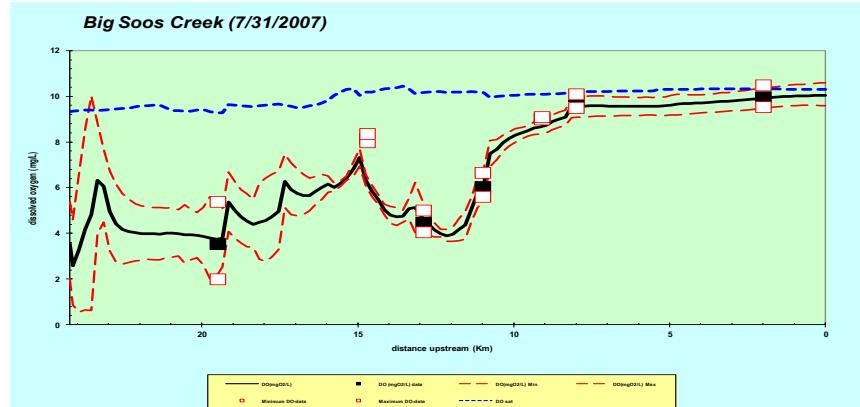
“Patchwork” of Problems

- Boise River – periphyton
- White River – pH
- Snake R. – macrophytes
- Long Lake reservoir – DO
- Brownlee reservoir – phytoplankton and DO
- Klamath basin – pH, DO, phytoplankton
- Puget Sound – DO



“Menagerie” of Models

- Boise River – AQUATOX, mass balance
- White River – QUAL2Kw
- Snake River – mass balance
- Long Lake reservoir – CE-QUAL-W2
- Brownlee reservoir – CE-QUAL-W2
- Puget Sound – FVCOM/CE-QUAL-ICM



CASE-BY-CASE

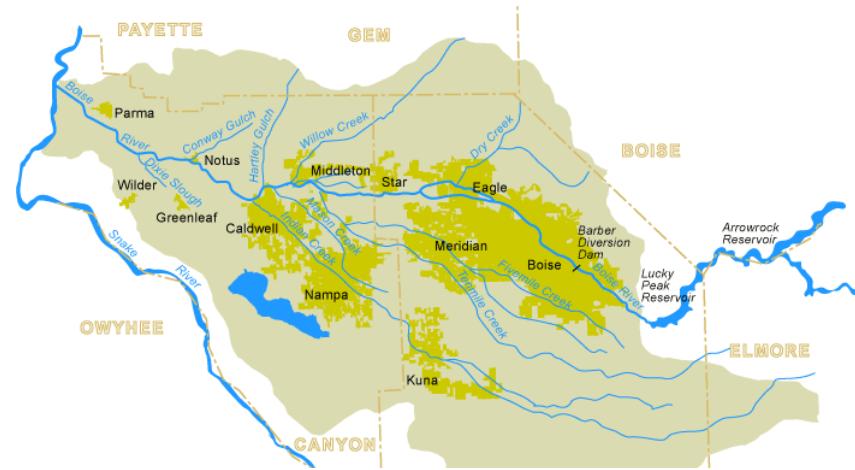
Water Quality Standards

- now and future -

- Numeric criteria for dissolved oxygen, pH
- Narrative criteria
- Oregon : Chlorophyll-a criterion for lakes, reservoirs and estuaries
- Numeric nutrient criteria?

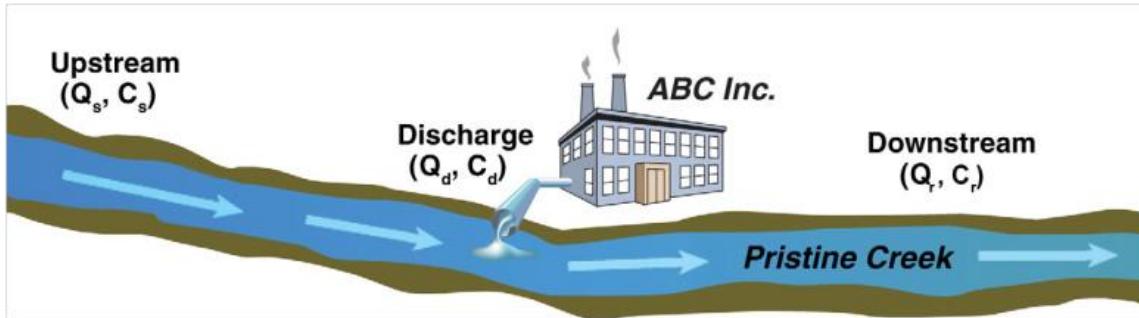


Boise River



- Boise River phosphorus load effects algae growth and dissolved oxygen in Brownlee reservoir
- TMDL for reservoir allocates Total Phosphorus less than 70 ug/L at mouth of the Boise River
- TP target is like a numeric TP criterion
- Allows assessment using simple mass balance

Mass Balance Model



$$Q_{up} \cdot C_{up} + Q_{eff} \cdot C_{eff} = (Q_{up} + Q_{eff}) \cdot C_{down}$$

Big Conservative Assumption:

- No settling, plant uptake, or transformation



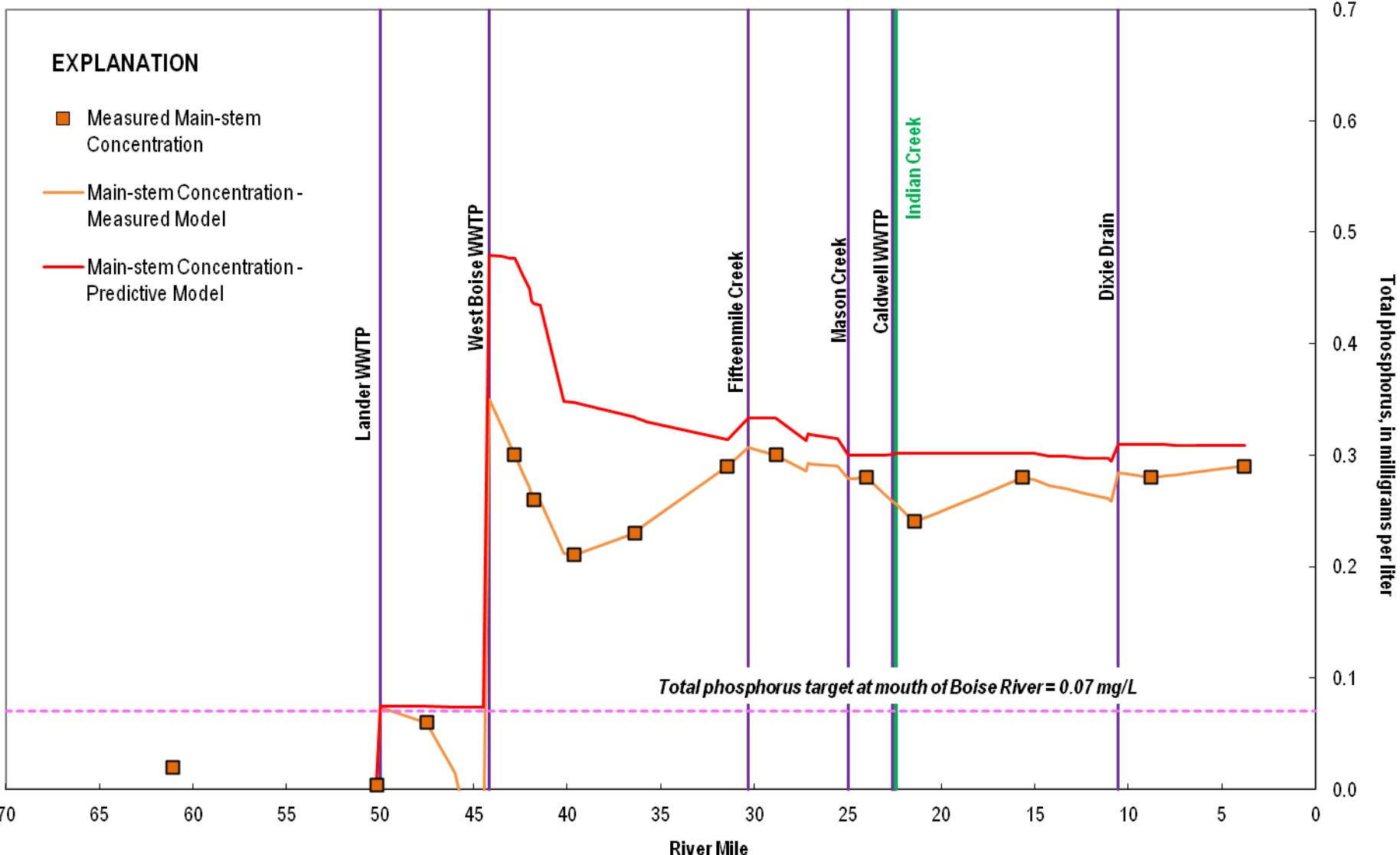
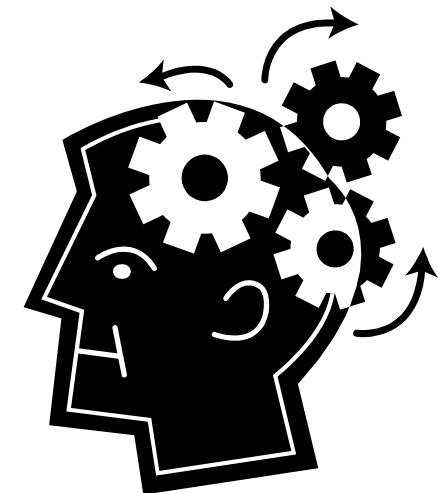


Figure 13A. Modeled and measured main-stem total phosphorus concentrations, week of October 29, 2012, lower Boise River, southwestern Idaho. [Abbreviations: WWTP, wastewater treatment plant.]

Great tool, but...

- Is 70 ug/L a good number for local effects in the Boise River?
- Problem: nuisance periphyton
- Mass balance does not give us algae growth related to TP
- So we need...AQUATOX!

He's back...!



Boise River

Suite of Numeric Criteria

- Reservoir
 - Algal Chla and DO criteria within the reservoir
 - TP “criterion” assigned to Boise river
- River
 - DO, pH criteria (currently met)
 - Periphyton chla “criterion”
- Mixture of aquatic life and recreation uses

The End

Acknowledgement: Alex Etheridge, USGS Boise

